TSG/ESD/TEB-048/70
9 December 1970

MEMORANDUM FOR THE RECORD

SUBJECT: In-Plant Acceptance Tests (Part 1) of the [redacted] High Precision Stereocomparator

25X1

REF : Acceptance Test Ultra High Precision Stereocomparator prepared 15 June 1970, revised 15 September 1970

1. This memorandum documents Part 1 of the In-Plant Acceptance Tests of the High Precision Stereocomparator. The tests were performed from 1600 on 17 November to 2030 on 19 November.

2. The data taken is listed in this memorandum in tabular form where applicable. In other cases, narrative explanations of procedure are provided. Reference is made on each test to the appropriate section in the referenced Acceptance Test Plan.

Procedure. Part 1.

A.1. thru A.8. These tests assured that the panel meters responded to observed changes in optical elements. The thrust of the test was not to check calibration of the meters, but to assure that they followed the movements of the elements. A.6. was not checked off because a minor glass element had been broken and not yet replaced. The remaining tests were satisfactory.

A.9. and A.10. These tests checked 7 working parts of the system 1) joystick movement, 2) trackball movement, 3) anamorph ratios, 4) objective lens interchangability, 5) zoom magnification, 6) Binocular mono switching capability, and 7) focusing capability. It also showed an inaccuracy in the calibration of the rotation panel gauges. The left gauge was off by 60°. Other than that, the tests were satisfactory.

A.11. thru A.14. These tests checked the controllability of the platen illumination system. These tests were satisfactory.

B. This section was to show that the gauge and flow meters on the air system were working properly and set correctly. The procedure pointed out the need to assign a nominal value plus a tolerance for variability in a dynamic machine condition.

Item B.1. was not set at the nominal value because it was using machine-shop air. When a single-purpose compressor is used, as it will be in the operational system, these listed values can be attained.

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	Listed Value	Actual Value	Corrected Value to be used
1.a.	160 psig, min	142 ± 10 psig	160 psig, min
1.b.	155 psig	125 ± 5 psig	155 psig
2.a.	155 psig	47 psig	47 psig
2.b.	25 psig	38 psig	38 psig
3.a.	0.7 SCFH	0.5 - 1.0 SCFH	0.5 - 1.0 SCFH
3.b.	0.7 SCFH	0.5 - 1.0 SCFH	0.5 - 1.0 SCFH
4.a.(1)	100 psig	~100 psig	100 ± 5 psig
4.a.(2)	100 psig	~100 psig	100 ± 5 psig
4.b.(1)	100 psig	~100 psig	100 ± 5 psig
4.b.(2)	100 psig	~100 psig	100 ± 5 psig
5.	100 psig	~100 psig	100 ± 5 psig
6.	90 psig	~90 psig	90 ± 5 psig
7.	20 psig	~20 psig	20 ± 2 psig
8.a.	30 SCFH	~30 SCFH	30 ± 3 SCFH
8.b.	30 SCFH	~30 SCFH	30 ± 3 SCFH
8.c.	30 SCFH	~30 SCFH	30 ± 3 SCFH
8.d.	30 SCFH	~30 SCFH	30 ± 3 SCFH
9.a.	500 SCFH	400 SCFH	400 ± 30 SCFH
9.b.	500 SCFH	400 SCFH	400 ± 30 SCFH
10.a.	70 SCFH	~70 SCFH	70 ± 5 SCFH
10.b.	70 SCFH	~70 SCFH	70 ± 5 SCFH
11.a.	90 SCFH	~90 SCFH	90 ± 5 SCFH
11.b.	90 SCFH	~90 SCFH	90 ± 5 SCFH
12.	7.5 psig	~13 psig	13 ± 1 psig
13.	25 psig	~25 psig	25 ± 1 psig

C.1. The left and right trackballs were each moved thru 1 full rotation in X and Y directions. This was repeated 6 times for each direction. The nixie readouts were zeroed before each rotation. The results are listed below.

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Run	Left X	Left Y	Right X	Right Y
1	31.4	31.5	31.5	31.5
2	31.5	31.4	31.5	31.5
3	31.6	31.5	31.6	31.5
4	31.4	31.5	31.7	31.5
5	31.5	31.5	31.6	31.2
6	31.5	31.5	31.4	31.5

C.2. The identical procedure was followed in this series as in C.1., except that the "Trackball Coarse" button was depressed as opposed to "Trackball Fine" in the previous test. Also, it is necessary to use the computer program for this test.

Trial	Left X	Left Y	Right X	Right Y
1	1017.4	997.2	1048.1	1008.0
2	997.4	1002.3	1047.5	1008.1
3	1042.6	1002.3	1011.0	992.5
4	971.8	1037.7	1007.2	997.7
5	972.4	992.2	1012.9	1007.7

D. This series of tests was run to determine the maximum and minimum speed attainable with the joystick controlling the stage motion.

D.1.a. This data represents the minimum time required for 6 inches motion of the stages in each direction for both stages.

	Left X	Left Y	Right X	Right Y
	(All readings in seconds per 6 inches)			
Observer 1	2.70	2.80	2.80	2.50
	2.40	2.80	2.50	2.80
	2.50	2.60	2.40	2.40
	2.35	2.70	2.40	2.60
	2.90	2.80	2.30	2.30
Observer 2	2.50	2.70	2.50	2.50
	2.70	2.70	2.30	2.40
	2.30	2.70	2.40	2.50
	2.50	2.70	2.40	2.40
	2.30	2.70	2.40	2.40
Avg Time	2.52 sec	2.72 sec	2.44 sec	2.48 sec
Avg Speed	2.38 ips	2.21 ips	2.46 ips	2.42 ips

D.1.b. The minimum speed of the stages, 10 μm/sec, was set by the programming of the computer. No matter how far the joystick was deflected, this speed remained constant. While this satisfied the letter of the

specification, it did not satisfy the intent. This test will be run in a different fashion after completion of the machine and installation at NPIC.

D.2. a.&b. The left stage can be returned to an original position within ±0.124 µm, x & y direction.

D.2. c.&d. The right stage can be returned to an original position within ±0.136 µm, x direction, and within ±0.125 µm, y direction.

E. This series of tests checked the time required to clamp 20 inch lengths of film 70 mm, 6.6 inches and 9.5 inches wide on each stage.

	70 mm 4 mil thick	6.6 inch UTB	6.6 inch 4 mil	$9\frac{1}{2}$ inch 4 mil
Left Stage	1.5	26	17	7
	2.0	33	28	22
	1.5	29	40	21.5
	2.0	34	24	37.
	2.0	51	47	32
Avg Time	1.8	34.6	31.2	25.9
Right Stage	2	54	36	53
	1.5	38	46	47
	1.0	52	53	42
	1.5	46	65	45
	1.0	32	95	25
Avg Time	1.4	44.4	59	42.4

F.1 The difference in 3.0 & 3.1 density was quite apparent when one looked at the field of view.

F.2 The color filter does move in and out of the optics train on both sides. No measurement has been made at this time of its transmission characteristics.

F.3 The image wander was not checked during this series of tests. An attempt to measure the backlash of the objective focusing system was made, but failed due to the lack of a smooth surface on the objective turrent on which to indicate.

F.4 The EDL anamorphic target was measured with a fixed eyepiece reticle in order to determine the anamorphic setting. It was determined that the anamorphic correction was operating within 1%.

The distance measured at 1:1.0 anamorph setting was 11.5 At 1:1.5, the distance read was 11.7 At 1:2.0, the distance read was 11.55. Therefore, the actual anamorph connection @ 1:1.5 was off by $\frac{0.2}{11.5}$, or 1.7%.

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The correction @ 1:2.0 is off by $\frac{0.05}{115}$ or 0.3$\frac{1}{2}$%.

F.5 The zoom range was measured by reading the distance on a scale between fixed lines in an eyepiece reticle.

On the left side, the distance between the fixed lines was measured to be 9.75 @ 10x. At 100x, the distance was read to be 97.5. The ratio, then, was $\frac{97.5}{9.75}$ or 10/1.

The right side read 9.8 @ 10x and 98.6 at 100x. The ratio was $\frac{98.6}{9.85}$ or 10/1.

F.6 Attachments 1 & 2 are a tabulation of the resolution read on the HPS. The target used was a 1951 USAF Resolution Target, 240x Reduction TEB Ser. No. 5.

[redacted] 25X1

Test Engineer
TEB/ESD

Attachments:
as stated above

Distribution:
Orig. - Chrono File
1 - Project File
25X1 1 - TSG/RED [redacted]
1 - IEG/PHD
25X1 1 - [redacted]